CLAIMS

1 An optical pick-up comprising:

a lens holder for supporting an object lens;

a supporting block disposed in a tangential direction perpendicular to a focus direction which is parallel to the optical axis direction of the object lens with a space provided between the supporting block and the lens holder;

a supporting arm for connecting the lens holder and the supporting block to movably support the lens holder in the focus direction and in a tracking direction perpendicular to the tangential direction with respect to the supporting block;

a pair of focus coils which are attached to the lens holder and supplied with drive current to move the lens holder in the focus direction; and

magnets which are supported by a yoke and face the pair of focus coils respectively,

wherein,

the pair of focus coils have coil surfaces which are perpendicular to winding axes of the respective focus coils and face the magnets, and are so attached to the lens holder as to face the tangential direction with the object lens put therebetween, the pair of focus coils being shifted in left and right directions respectively away from a virtual axis which is perpendicular to the tracking direction and passes along the optical axis of the object lens, the coil

surfaces being directed toward the tangential direction.

2 The optical pick-up as set forth in claim 1, further comprising:

a pair of tracking coils which are so attached to the lens holder as to face the magnets and supplied with drive current to move the lens holder in the tracking direction,

wherein the pair of tracking coils have coil surfaces which are perpendicular to winding axes of the respective tracking coils and face the magnets, and are so attached to the lens holder as to face the tangential direction in parallel to the focus coil with the object lens put therebetween, the pair of tracking coils being shifted in left and right directions respectively away from the virtual axis which is perpendicular to the tracking direction and passes along the optical axis of the object lens, the coil surfaces being directed toward the tangential direction.

3 The optical pick-up as set forth in claim 2,

wherein the supporting arms are formed from one supporting arms and the other supporting arms which are disposed at both sides of the virtual axis which is perpendicular to the tracking direction and passes along the optical axis of the object lens, the one supporting arms and the other supporting arms being formed from a pair of supporting arms respectively, which are arranged in parallel to the optical axis direction of the object lens,

a crossing point of a first virtual axis and a second virtual axis is

formed at a point having a same height as a center of drive on which a drive force is exerted, the drive force being produced by interaction of drive current delivered to the respective tracking coils and magnetic flux from the magnets, and is formed at a point having a same center as a center of gravity of the lens holder including the object lens, the focus coils and the tracking coils, the first virtual axis passing through a portion connecting an upper supporting arm of the pair of the one supporting arms, which is positioned upward in the optical axis direction of the object lens, and the lens holder as well as a portion connecting a lower supporting arm of the pair of the other supporting arms, which is positioned downward in the optical axis direction of the object lens, and the lens holder, the second virtual axis passing through a portion connecting a lower supporting arm of the pair of the one supporting arms, which is positioned downward in the optical axis direction of the object lens, and the lens holder as well as a portion connecting an upper supporting arm of the pair of the other supporting arms, which is positioned upward in the optical axis direction of the object lens, and the lens holder. .

4 The optical pick-up as set forth in claim 3,

wherein drive center on which a drive force is exerted is shifted away from the center of gravity of the lens holder, to which only the object lens is attached, in the optical axis direction of the object lens, the drive force being produced by interaction of drive current delivered to the respective focus coils

and magnetic flux from the magnets.

5 The optical pick-up as set forth in claim 1,

wherein a spacing between the respective magnets, which are so arranged as to face the coil surfaces of the pair of focus coils, and a spacing between the coil surface of the focus coil and the magnet are equal to each other in the tangential direction.

6 The optical pick-up as set forth in claim 1,

wherein a spacing between the respective magnets, which are so arranged as to face the coil surfaces of the pair of focus coils, and a spacing between the coil surface of the focus coil and the magnet are different from each other in the tangential direction.

7 The optical pick-up as set forth in claim 5,

wherein the numbers of windings of the pair of focus coils is made different from each other.

8 The optical pick-up as set forth in claim 2,

wherein the magnet facing the focus coil and the tracking coil which are attached in parallel to one surface sides opposite to each other of the lens holder, and the magnet facing the focus coil and tracking coil which are attached in parallel to the other surface sides opposite to each other of the lens holder are respectively constituted by integrated magnets.

9 The optical pick-up as set forth in claim 8,

wherein the respective magnets are magnetized so that a plane surface facing one sides opposite to each other in the optical axis direction of the object lens of the focus coil formed so as to take rectangular shape and a plane surface facing the other sides thereof have poles different from each other, and are magnetized so that a plane surface facing one sides opposite to each other in the tracking direction of the tracking coil formed so as to take rectangular shape and a plane surface facing the other sides thereof have poles different from each other.

10 The optical pick-up as set forth in claim 2,

wherein the focus coil and the tracking coil which are attached to one surface of the lens holder are attached, winding center being shifted in the optical axis direction of the object lens which is supported by the lens holder.

11 The optical pick-up as set forth in claim 1,

wherein two object lens are supported by the lens holder in the tangential direction.

12 The optical pick-up as set forth in claim 8,

wherein a spacing between the respective magnets, which are so arranged as to face the coil surfaces of the pair of focus coils, and a spacing between the coil surface of the focus coil and the magnet are different from each other in the tangential direction.

13 An optical disc apparatus including drive means for holding and

rotationally driving an optical disc, and an optical pick-up for irradiating light beams serving to record or reproduce information signals for the optical disc which is rotationally driven by the drive means, and for detecting reflected light beams reflected from the optical disc,

the optical pick-up comprising:

a lens holder for supporting an object lens;

a supporting block disposed in a tangential direction perpendicular to a focus direction which is parallel to the optical axis direction of the object lens with a space provided between the supporting block and the lens holder;

supporting arms for connecting the lens holder and the supporting block to movably support the lens holder in the focus direction and in a tracking direction perpendicular to the tangential direction with respect to the supporting block;

a pair of focus coils which are attached to the lens holder and supplied with drive current to move the lens holder in the focus direction; and

magnets which are supported by a yoke and face the pair of focus coils respectively,

wherein,

the pair of focus coils have coil surfaces which are perpendicular to winding axes of the respective focus coils and face the magnets, and are so attached to the lens holder as to face the tangential direction with the object

lens put therebetween, the pair of focus coils being shifted in left and right directions respectively away from a virtual axis which is perpendicular to the tracking direction and passes along the optical axis of the object lens, the coil surfaces being toward the tangential direction.

14 The optical disc apparatus as set forth in claim 13, further including

a pair of tracking coils which are so attached to the lens holder as to face the magnets, and supplied with drive current to move the lens holder in the tracking direction,

wherein the pair of tracking coils have coil surfaces which are perpendicular to winding axes of the respective tracking coils and face the magnets, and are so attached to the lens holder as to face the tangential direction in parallel to the focus coils with the object lens put therebetween, the pair of tracking coils being shifted in left and right directions respectively away from the virtual axis which is perpendicular to the tracking direction and passes along the optical axis of the object lens, the coil surfaces being directed toward the tangential direction.

15 The optical disc apparatus as set forth in claim 14,

wherein the supporting arms are formed from one supporting arms and the other supporting arms which are disposed at both sides of the virtual axis which is perpendicular to the tracking direction and passes along the optical axis of the object lens, the one supporting arms and the other supporting arms

being formed from a pair of supporting arms respectively, which are arranged in parallel to the optical axis direction of the object lens, and

a crossing point of a first virtual axis and a second virtual axis is formed at a point having a same height as a center of drive on which a drive force is exerted, the drive force being produced by interaction of drive current delivered to the respective tracking coils and magnetic flux from the magnets, and is formed at a point having a same height as a center of gravity of the lens holder including the object lens, the focus coils and the tracking coils, the first virtual axis passing through a portion connecting an upper supporting arm of the pair of the one supporting arms, which is positioned upward in the optical axis direction of the object lens, and the lens holder as well as a portion connecting a lower supporting arm of the pair of the other supporting arms, which is positioned downward in the optical axis direction of the object lens, and the lens holder, the second virtual axis passing through a portion connecting a lower supporting arm of the one supporting arms, which is positioned downward in the optical axis direction of the object lens, and the lens holder as well as a portion connecting an upper supporting arm of the pair of the other arms, which is positioned upward in the optical direction axis direction of the object lens, and the lens holder.

16 The optical disc apparatus as set forth in claim 13,

wherein a spacing between the respective magnets, which are so

arranged to face the coil surfaces of the pair of focus coils, and a spacing between the coil surface of the focus coil and the magnet are different from each other in the tangential direction.

17 The optical disc apparatus as set forth in claim 13,

wherein the numbers of windings of the pair of focus coils is made different from each other.

18 The optical disc apparatus as set forth in claim 13,

wherein a spacing between the respective magnets, which are so arranged as to face the coil surfaces of the pair of focus coils, and a spacing between the coil surface of the focus coil and the magnet are equal to each other in the tangential direction, the number of windings of the pair of focus coils being made different from each other.

19 The optical disc apparatus as set forth in claim 14,

wherein the magnet facing the focus coil and the tracking coil which are attached in parallel at one surface sides opposite to each other of the lens holder and the magnet facing the focus coil and the tracking coil which are attached in parallel at the other surface sides opposite to each other of the lens holder are respectively constituted by integrated magnets.

20 The optical disc apparatus as set forth in claim 18,

wherein the respective magnets are magnetized so that a plane surface facing one sides opposite to each other in the optical axis direction of the

object lens of the focus coil formed so as to take rectangular shape and a plan surface facing the other sides thereof have poles different from each other, and are magnetized so that a plane surface facing to one sides opposite to each other in the tracking direction of the tracking coil formed so as to take rectangular shape and a plane surface facing the other sides thereof have poles different from each other.